

Agricultural insurance and slow-onset events in the Mekong region: Issues and options for moving forward

Introduction

In developing countries, disasters caused approximately USD 80 billion in crop and livestock production losses between 2003 and 2013. During the same period, 25% of all economic losses from climate-related disasters (i.e. floods, droughts and tropical storms) were absorbed by the agricultural sector (FAO 2015). The high dependency on agriculture for food and income among many developing countries means climate-related disasters have significant and wide-spread impact on rural livelihoods and food security.

Agricultural insurance is increasingly considered by decision-makers as a key approach to reducing the risk and socio-economic impact of disasters, while also incentivizing farmers to adapt to new and changing climate risks (GIZ 2015). For instance, agricultural insurance and risk financing are currently considered a strategic regional risk management programme by the Association of South East Asian Nations (ASEAN) Member States, as evidenced by the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) and the ASEAN Disaster Risk Insurance Programme (ASEAN 2016).

However, scientific research and on-the-ground experiences reveal limits to the ability of agricultural insurance to protect against the economic impacts of certain climate risks. In particular, slow-onset events – which develop more gradually than extreme disasters such as sea-level rise, drought and rising temperatures – are more difficult to monitor; therefore, providing insurance for these gradual threats is also more difficult (UNFCCC 2012). Thus, there is a need for policy-makers to critically assess the suitability of insurance for climate risk management and to develop diverse risk management strategies including more innovative financial risk-sharing mechanisms (CIGI 2016; Schaefer and Waters 2016).

Insights into the limitations of agricultural insurance in the context of slow-onset events are particularly relevant in the Mekong region,¹ where climate risks have direct and observable impacts on agriculture and food security. In 2016, for instance, the Mekong River fell to the lowest levels reported in the nearly 100 years since record-keeping began, bringing hardship to the more than 45 million people who depend on the river for food and income.² The relative contributions of rainfall levels and water resource management infrastructure (i.e. dams and levees) on reduced flow leading to drought is contested in the Mekong (see (Adamson and Bird 2010)(Tran and James 2017)), but the potential for worsening impacts on vulnerable farmers associated with climate change is not.



Farmers transplant rice in Kompong Khleang, Tonle Sap, Cambodia.

This brief considers the suitability of agricultural insurance in protecting farmers and the agriculture sector against slow-onset risks faced in the Mekong region. Through two case studies – sea-level rise in the Vietnamese Mekong Delta and drought in northeastern Thailand – we examine slow-onset risks, existing agricultural insurance strategies, and the implications for insurance feasibility in the context of a holistic risk management approach. Specifically, the brief aims to:

1. Review the use and limitations of agricultural insurance in Viet Nam and Thailand.
2. Discuss the challenges and implications for insuring against slow-onset risks in the Mekong region.
3. Consider the opportunities for managing the risk of slow-onset events in the Mekong region through other financial measures and more holistic risk management approaches that are being tried in other regions of the developing world.

This brief is based on a review of the scientific literature, governmental reports, and discussions with experts and governmental representatives who participated in a workshop on insurance and slow-onset events organized by the ASEAN Climate Resilience Network, in September 2016.

Agricultural insurance in developing countries and climate change

About 100 million people in Africa, Asia and Latin America are currently covered by some form of insurance for climate-related risks (GIZ 2015). Activity in this area has picked up since the early 2000s, with individual countries and multilateral organizations rolling out agriculture insurance policies, including index-based insurance, that are de-

¹ Here, the Mekong region refers to the Lower Mekong countries of Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam.

² <http://www.irinnews.org/news/2016/05/10/dams-drought-and-disaster-along-mekong-river>

Box 1: Indemnity- vs. Index-based Insurance

Indemnity-based insurance is based on the principle that compensation is provided for particular losses suffered by an insurance holder. This principle is used in crop insurance in the United States, and in livestock insurance in Viet Nam under the National Agricultural Insurance Pilot Programme (NAIPP).

Index-based insurance uses a parameter (e.g., measurement of rainfall or temperature) to estimate the correlated losses of a crop in a certain area, for example. Farmers in that area receive payouts based on the parameter, rather than on an

in-field assessment – thus providing farmers with financial support more quickly than would be expected under the assessment requirements of indemnity-based insurance.

Furthermore, index-based insurance can also reduce the risk of moral hazard (the possibility that people who are insured will take greater risks than they would have taken if they had remained uninsured) and adverse selection (the possibility that risk takers disproportionately seek insurance coverage). Index-based insurance reduces these two risks since farmers have the same in-

urance payout conditions, regardless of their specific risk exposure or practices. In addition, index-based insurance minimizes the likelihood of fraud since payouts are not made based on individual damage claims.

But index-based insurance also has one major disadvantage compared to indemnity-based insurance: farmers are exposed to significant base risk since payouts are not dependent on observed losses; an index estimate may not be representative of actual crop losses suffered by individual farmers (Skees 2008).

signed specifically for developing countries (GFDRR 2014). See Box 1 for a brief explanation of the two primary types of insurance: indemnity-based and index-based.

However, achieving the widespread implementation of effective agricultural insurance in developing countries faces a number of challenges. Low market penetration limits the ability of insurers to spread risk geographically, pool different types of risks, or apply risk-differentiated pricing (Skees et al. 2008). In addition, the scarcity of reliable and detailed data regarding farmers' exposure and vulnerability makes it difficult for insurers to price premiums and assess potential payouts correctly (Mahul and Stutley 2010). Moreover, government-subsidized rates can create perverse incentives for farmers not to take risk-mitigating actions (ATAI 2016).

Such challenges have strong implications for the financial sustainability, availability and widespread adoption of insurance programmes. The inability of insurers to appropriately assess, spread and pool their risks significantly increases transaction, administrative and capital/reinsurance costs (Skees et al. 2008). In the event that farmers' demand for insurance positively correlates with their risk, costs for payouts could easily and continually exceed revenue generated by premiums. Unless these issues are appropriately addressed, they could lead to the commercial failure of agricultural insurance programmes in emerging markets, such as those in Thailand and Viet Nam (Schaefer and Waters 2016).

Climate change is expected to place additional constraints on the availability and sustainability of agricultural insurance, particularly in developing countries. The lack of data makes policy-writing difficult for insurers, and uncertainties associated with the long-term implications of climate change only add to the challenge. By affecting the frequency and intensity of extreme events, climate change is likely to increase the costs associated with insurance against such risks. Under these circumstances, insurers may decide that certain areas or certain risks are simply no longer insurable from an economic viability standpoint (Skees et al. 2008).

Agricultural insurance in the Mekong region

Risks to agricultural production have long existed in the Mekong but, as the region has developed economically on the backbone of increasing revenues from the export of staple crops, protecting the sector from external risks such as disasters and climate change has become a priority. From regional governments to local farmers, many actors have looked for effective ways to protect against growing risks and economic losses and damages, including through agricultural insurance.

Viet Nam

Agricultural insurance first emerged in Viet Nam in 1982 with a small-scale pilot programme for rice farmers. Despite various plans and government policies since then, the insurance market has struggled to grow due to various factors including low awareness, high costs and the need for subsidization. Relatively small market shares meant that risks could not be accurately modelled or well managed. As a result, less than 1% of crops in Viet Nam were insured as recently as 2010. Following decades of stagnant growth, and heavy investments (upgrading irrigation, improving flood protection and stepping up pest- and disease-control measures), the Government of Viet Nam, in partnership with the country's two largest insurers and international reinsurers, implemented a three-year subsidized scheme in 2011 – the *National Agricultural Insurance Pilot Programme (NAIPP)*³.

The programme, implemented in 20 provinces, offers index-based insurance for rice, and indemnity-based insurance for livestock and aquaculture against the following hazards: storm, flood, drought, cold temperatures, frost, tsunami, and saline intrusion (OECD 2015). The inclusion of saline intrusion as an insurable hazard is extremely important given the risks that the Vietnamese Mekong Delta faces. However, how this is measured and how claims are assessed remain unclear. The government subsidizes from 60% to 100% of insurance fees for participating farmers, depending on their degree of poverty. Nationwide, over 300,000 households participated,

3 http://institute.swissre.com/research/risk_dialogue/magazine/Strengthening_food_security/Agricultural_reinsurance_in_Vietnam.html

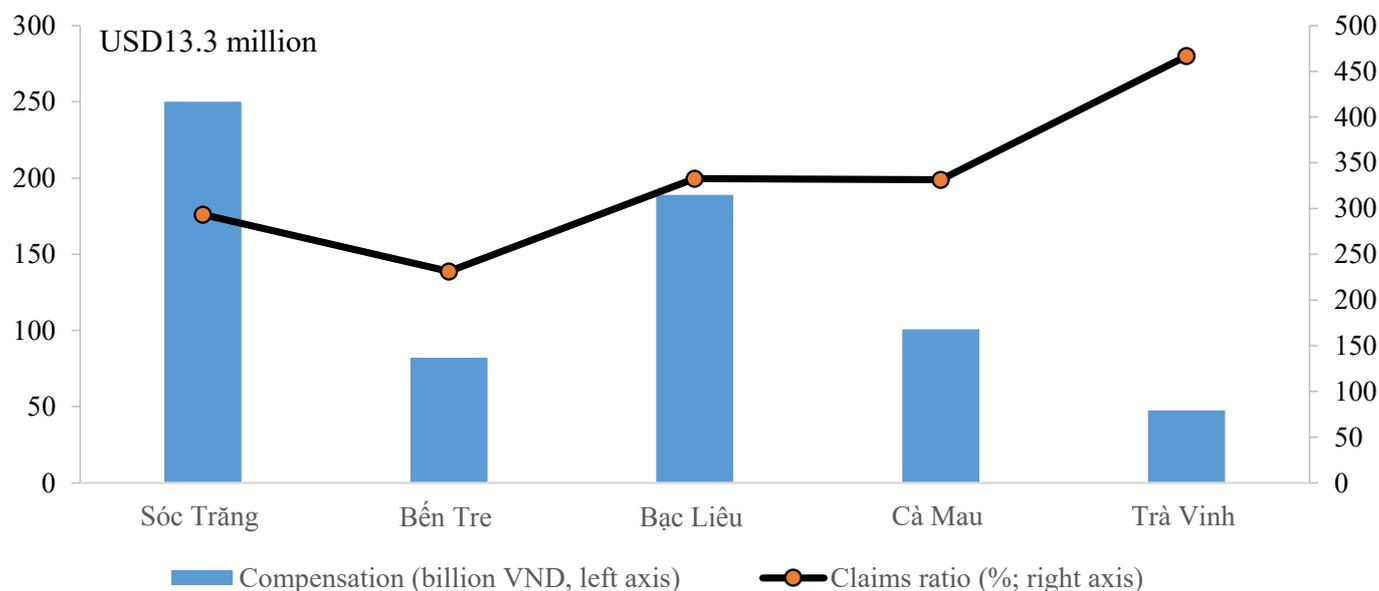


Figure 1: Compensation and Claims Ratio of the Viet Nam NAIPP for aquaculture, 2011-2013 (reproduced from Khoi et al. 2017).

Claim ratio is defined as the total indemnities paid by insurance companies divided by the total premiums collected. If it is lower than 100%, it means that the system is actuarially sustainable (Bielza et al. 2008).

78% of them insuring rice crops (20% insuring livestock and 2% aquaculture) and 77% of which had their insurance fully subsidized by the government (MOF 2014).

Participation in the NAIPP has depended heavily on subsidies, and voluntary participation rates were very low (Khoi et al. 2017). This calls into question the long-term sustainability of such heavily subsidized programmes and the ability of insurance to provide continuous and uniform financial protection for farmers with limited income. However, promotion and awareness-raising campaigns have seemingly improved understanding of the benefits of insurance among farmers (Khoi et al. 2017).

In the Mekong Delta, seven provinces participated in the NAIPP – two for rice crop insurance and five for aquaculture (shrimp and catfish) insurance. Data about the compensations and claim ratios for aquaculture insurance (Figure 1) show that paid compensations exceeded premiums by amounts that ranged from double the premiums to as much as four times the premiums, indicating that the NAIPP was poorly designed and struggled to become economically sustainable.

In fact, the NAIPP experienced a significant imbalance across insurance products in terms of fees and compensation rates; the high indemnity rates of the aquaculture insurance in the Mekong, as shown in Figure 1, caused an overall loss for the insurance companies (MOF 2014). However, compensation ratios for rice insurance remained economical between 2011-2013 (Khoi et al. 2017).

Furthermore, the programme has also been plagued by disagreements between farmers and insurers about incurred damages and insurance payouts, allegedly fraudulent claims by farmers, and measures by insurers to avoid payouts, which have sometimes led to litigation.⁴ Yet, in 2016 the Ministry of Finance re-emphasized the importance of the programme and began the processes necessary for a second phase.

Thailand

Agricultural insurance policies and programmes have been available in Thailand since the late 1970s, but with limited success. Weather index-based insurance first emerged in 2006 for maize (supported by the World Bank), and in 2008 for rice (supported by the Japan Bank for International Cooperation) (Oxford Business Group 2016). Between 2010 and 2014 the weather index rice insurance programme focused on drought risk, with participation peaking in 2014 at 4,320 farmers across 17 provinces within the Mekong basin (Sirimanne et al. 2015). As part of the 2011 flooding disaster-relief programme, micro-insurance coverage was made available to farmers whose crops were lost within a specific, government-defined area. The programme insured over 50,000 farmers with total net premiums amounting to THB 127 million (USD 4 million) yet the estimated loss was THB 575 million (USD 18 million); a loss ratio of 453%.⁵

Since 2014, the national rice insurance programme has taken over as Thailand's largest agricultural insurance programme. It covers losses due to flood or excessive rain, drought, frost, windstorm/typhoon, fire, and hail. In its first year the programme achieved insurance sales coverage of 800,000 rai (128,000 hectares), equivalent to 1.3% coverage of rice farmland in Thailand. In 2015 coverage increased to 1.51 million rai (2.3% coverage). The programme has to keep growing in coverage and uptake to ensure it makes economic sense and can be sustained; with such limited coverage levels, aid and relief services have, in effect, served as subsidized insurance thus far (Oxford Business Group 2016). The 2016 programme sets an ambitious target of covering 3 million rai, presumably to spread risks and costs among the 16 local insurers working with the Thai General Insurance Association. The expected premium rate has come down quite significantly (to 100 THB per rai in 2016, from between 124.12 and 483.64 THB per rai in 2015), with the government subsidizing 60% and the Bank

4 Information provided by a local expert

5 <http://www.oecd.org/daf/fin/49657525.pdf>; 1 million THB = 31,308,70 USD [1 USD = 31,94 THB (2011 average exchange rate)]

for Agriculture and Agricultural Cooperatives (BAAC) paying the remaining 40% if farmers are BAAC loan customers. (Otherwise, the farmer pays the remaining 40%.) Crucially, the trigger for claims is determined by the boundaries of the local government-declared disaster area, and the farm must be declared a total loss under the loss assessment procedures of the disaster relief programme.⁶

Slow-onset events in the Mekong region

Climate-related slow-onset events have only recently been acknowledged by the international policy community (UNFCCC 2011). These events include sea-level rise, increasing temperatures, desertification, loss of biodiversity, forest and land degradation, glacial retreat, ocean acidification and salinization (UNFCCC 2012).⁷ As the name implies, climate-related slow-onset events unfold gradually over time and are more akin to processes than to sudden-onset extreme events, such as floods and tropical storms. Another difference is that sudden-onset hazards are naturally occurring phenomena, but their frequency, severity and distribution are now being altered by human activity. Slow-onset events, on the other hand, are caused entirely by man-made climate and global change. A review for the UNFCCC found that slow-onset events are already negatively affecting developing countries, and the resulting loss and damage are likely to increase significantly, even if appropriate mitigation and adaptation action is taken (UNFCCC 2012).

The impact of climate change, including slow-onset events, in the Mekong region has been a pressing concern for a number of years. At the regional level the Mekong River Commission's Climate Change and Adaptation Initiative drew governments' attention to the issue.⁸ Subsequent programmes such as the U.S. Agency for International Development's Mekong Adaptation and Resilience to Climate Change (Mekong ARCC) have sought to integrate climate science into national and local decision-making and have assessed rural adaptation measures, particularly for the agricultural sector.⁹ This brief focuses on two slow-onset event risks in Lower Mekong Basin countries: sea-level rise and the related impact of saltwater intrusion in Viet Nam, and drought, closely linked to temperature increase, reduced precipitation and desertification, in Thailand.

Sea-level rise and saltwater intrusion in Viet Nam

The last IPCC Assessment Report concluded, with high confidence, that projected sea-level rise is very likely to result in a significant loss of coastal ecosystems and an additional 1 million people living in coastal areas in South and Southeast Asia at risk from flooding (Hijioka et al. 2014). In particular, sea-level rise is expected to contribute to increased inundation of cropland and saltwater intrusion¹⁰ which raises concerns over food security.

However, it is worth noting that coastal ecosystems are under severe pressure from non-climate impacts; many large deltas in Asia, including the Mekong, are sinking – largely due to groundwater extraction and trapping of sediment by dams – much faster than the global sea level is rising. Erban et al. (2014) estimate that if groundwater extraction continues at present rates, the Mekong Delta will have subsided ~0.88 metres (0.35–1.4 m) by 2050, compounded by ~0.10 m (0.07–0.14 m) of anticipated sea-level rise. This would result in an estimated range for total additional inundation depth of between 0.4 and 1.6 m by 2050.¹¹

A World Bank study (2010) estimates that the potential aggregate impacts of climate change, which includes a sea-level rise of 30 cm, will lead to declines of between 6% and 12% in rice yields in the Mekong Delta by 2050. In addition, both capture fisheries and aquaculture production in the delta would be negatively impacted (De Silva and Soto, 2009). Overall, then, sea-level rise is likely to exacerbate these non-climatic pressures in the Mekong Delta. The Government of Viet Nam estimates a 1m rise would result in 38% of the land of the entire Mekong Delta being inundated during the wet season (MNRE 2016).

Drought in Thailand

Though technically an extreme weather event, drought is closely tied to slow-onset processes such as rising temperatures, land degradation and desertification (UNFCCC 2012). A drought is a “period of abnormally dry weather long enough to cause a serious hydrological imbalance” (IPCC 2012, p.167). Droughts negatively impact crop yields and can have knock-on effects on food security, livelihoods, health and nutrition. They also disproportionately affect smallholder farmers and agricultural laborers who lack access to rural safety nets and financial services (Garbero and Muttarak 2013).

As noted, reliable historical data on drought frequency and intensity are largely lacking. Nevertheless, drought is considered a significant risk to the agriculture sector due to a series of events in recent years, including the 2016 drought – the worst in 15 years.¹² Severe drought has affected other Lower Mekong countries, too, particularly Viet Nam, where low water levels have led to saltwater intrusion as far as 90k m inland in some coastal areas, affecting irrigation, crop production and drinking water supplies (FAO 2016). In addition to the expected worsening of droughts in the region due to climate change, future hydropower plans may also exacerbate drought impacts in the coming years and decades for the vulnerable agriculture sector.¹³

Limitations of insurance against slow-onset events in the Mekong

Based on an assessment of insurance programmes in Viet Nam and Thailand and experiences from other countries, insuring against slow-onset events in the agriculture sector faces a number of limitations, including high loss-to-premium ratios, low levels of voluntary participation, and

6 Information presented by Busaraporn Rattanayod, Ministry of Finance Thailand, at the ASEAN workshop in September 2016.

7 Salinization refers to soil salinization from evaporation resulting from increasing temperatures as well as saltwater intrusion caused by sea-level rise or coastal flooding (UNFCCC 2012).

8 <http://www.mrcmekong.org/about-mrc/completion-of-strategic-cycle-2011-2015/climate-change-and-adaptation-initiative/>

9 <http://www.mekongarcc.net/resource/final-report-usaid-mekong-adaptation-and-resilience-climate-change>

10 Salinity intrusion is the movement of saline water into freshwater aquifers which can lead to the contamination of drinking water and soil.

11 Estimates based on the IPCC AR5 (Church et al. 2013) range of average absolute sea-level rise rates.

12 <https://www.reuters.com/article/us-thailand-drought-idUSKBN0L917F20150205>

13 <https://www.irinnews.org/news/2016/05/10/dams-drought-and-disaster-along-mekong-river>



A farmer ploughs the rice field in Tonle Sap, Cambodia

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disputes about compensation. In the case of Viet Nam, where agricultural insurance may have been around since 1982, the fact that the government is still piloting “new” programmes suggests a general lack of success of previous efforts. Beyond the move from indemnity-based to index-based insurance, it remains unclear whether the causes of past insurance failures have been reconciled in new pilot programmes.

Setting aside current issues, there are several principal issues with insuring against slow-onset events. Firstly, there is the general issue of uncertainty around how climate change will impact risks, both extreme and slow onset, and this is not well enough understood from the perspective of the finance sector. Secondly, slow-onset events in general do not meet two preconditions for insurability – event unpredictability (sudden and unforeseen losses) and the ability to spread risk over time and areas. The fact that slow-onset events unfold gradually means that their economic impacts are accumulative and potentially hard to detect versus the abrupt costs of extreme events that are more discrete and rapidly occurring. Insurance programmes are bound to eventually fail if they cannot adequately price risks, or if risks become more frequent and severe over time. Thus, experts largely agree that insurance is not the appropriate approach to respond to the risks of slow-onset events (Schaefer and Waters 2016).

The NAIPP in Viet Nam lists saltwater intrusion as a peril insurance-holders are protected against; a risk which the UNFCCC (2012) defines as slow onset. The complexity of saltwater intrusion as a risk poses a significant challenge for insurance schemes. Salinization of groundwater and soil has existed in the Mekong Delta for decades; it is a part of daily and seasonal life. As a risk, it is uncertain and changes are likely to be too incremental from an insurance perspective; a 2016 study found that, due to drought conditions, saltwater

intrusion levels rose two months earlier than the “normal” cycle and peaked at a higher level than anticipated covering a greater area of land and not subsiding until after the dry season (CGIAR Research Centers in South Asia 2016).

Slow-onset events also pose challenges for the Thai rice insurance programme. Climate change is expected to adversely affect conditions for rice production (Felkner et al. 2009), and past droughts and floods have shown how vulnerable rice farmers in Thailand are to its impacts. In the future, it will be challenging to continuously adjust the rice insurance programme to the rising risk from both sudden and slow-onset events related to climate change, and at the same time keeping premiums low enough to grow the numbers of insured farmers.

Other financial mechanisms to strengthen farmers’ resilience against slow-onset events

As the examples of Thailand and Viet Nam show, agricultural insurance may offer some relief in the case of short-term events such as droughts and floods. But insurance is ill-suited to deal with the gradually unfolding consequences of increasing temperatures or sea-level rise on agriculture. In fact, climate change poses a threat to the economic sustainability of insurance. Comprehensive policy approaches are needed that can deal with the complexity of slow-onset event processes and the sudden shocks and accumulative stresses they impose on farmers. These policies need to build resilience and address the underlying causes for vulnerability of farmers including poor development practices, poverty and inequality (Schipper et al. 2016).

To deal with the immediate effects of climate change associated with slow-onset events, policy-makers have a number of other financial mechanisms available that can



At Tonle Sap Lake in Cambodia, and throughout the Mekong region, aquaculture is a key source of income.

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complement insurance. To help farmers cope with the impacts of sea surges or droughts, policy-makers can consider cash- or asset-transfer mechanisms. Both measures can contribute to social protection of households, provide for their immediate needs, and reduce or prevent negative coping strategies (Davies et al. 2009).

Another option to explore in enabling resilience to the impacts of slow-onset events is micro-finance. This entails providing small loans and other financial services to the poor so that they can build up their assets, establish or maintain a business, increase their wealth, and protect against risks. Studies have shown that micro-finance can support the most vulnerable in coping with disasters by providing credit for addressing immediate needs or replacing lost livelihood income (Agrawala and Carraro 2010). It also fosters more long-term risk management by providing households with critical capital to build up their assets prior to an event (Becchetti and Castriota 2011).

To deal with the limited opportunities for insurance programmes to assess, pool and share risks, countries may pursue a regional cooperation approach. Sovereign risk sharing has emerged as one way for developing countries to jointly cover the costs of droughts and floods on agriculture. African Risk Capacity (ARC), for example, was established in 2012 by the African Union (AU) to help member states improve their capacities to better prepare for and respond to extreme weather events and disasters. Member countries pool and transfer risks from droughts, for example, and receive payouts from an index-based insurance that complements traditional disaster relief.

Compared to national insurance programmes, sovereign risk sharing promises a lower financial burden on governments. In the case of ARC, costs are reduced by purchasing

insurance coverage on international markets and by sharing the costs for risk assessment, damage appraisal and payouts. Further financial benefits arise from risk diversification by insuring multiple countries against different types of risks less likely to be spatially correlated (Clarke and Hill 2012). ASEAN Member States are currently exploring, but have not yet implemented, a similar financing mechanism.

Options to spur transformative changes in the Mekong region

Aside from insurance and other financial mechanisms designed to deal with short-term, relatively infrequent events, policy-makers also need to consider options that help farmers to deal with the long-term, cumulative impacts of climate-related slow-onset events. These options would need to go beyond simply retaining or sharing financial risks, and instead aim to tackle the root causes of exposure and vulnerability of farmers to climate change (USAID Mekong ARCC 2016). These options should be part of an equitable, inclusive and sustainable development plan. Such an approach would represent a transformative shift in climate risk management in the Mekong region.

One option is to promote crops or species suitable to a changing climate and use the natural endowment of the Mekong Delta to respond to slow-onset events. Although rice is the predominant crop in the delta, fish and shrimp are also produced at larger scales. The diversity of environments and resources in the delta offers multiple possible options to address the impacts of slow-onset events. For instance, adaptation to sea-level rise and salinity could include mangrove restoration; the introduction of temporary nurseries to increase robustness of shrimp prior to their release into aquaculture ponds; and the incorporation of salt-tolerant rice and sedge species into the farming system. Steps could be taken to maintain the richness of delta

ecosystems by, for instance, facilitating the depositing of nutrient-rich sediments and reducing the use of impeding structures (Chapman and Darby 2016).

Further options for policy-makers to promote transformative changes could involve supporting off-farm employment and, as a measure of last resort, assisted migration. Although off-farm work and migration might take labour away from household farms, they have been shown to diversify household sources of income through remittances (Huy and Nonneman 2016). Developing new skills for youth and proactive matching with labour demands in nearby urban centers could assist affected households. Demand for labour in cities, and land degradation in rural areas are already driving rural-to-urban migration in the Mekong region (van der Geest et al. 2012).

Conclusions

Experience with agricultural insurance in Viet Nam and Thailand in protecting farmers from extreme events has been very limited. Where insurance programmes have been rolled out, they have struggled financially due to high compensation rates and low voluntary uptake by farmers. Unless these barriers are overcome, agriculture insurance will remain a niche market heavily reliant on public subsidies. Nevertheless, empirical evidence suggests that insurance can offer farmers quick financial support in the wake of a disaster.

Responding to slow-onset events is a different challenge altogether for which agricultural insurance is not well suited. Slow-onset events, such as sea-level rise, temperature rise and drought, threaten the insurability of agriculture because risks are becoming more severe and frequent. The accumulative nature of slow-onset events also threatens the ability of farmers and insurers to adapt to rising costs.

What is needed is a clearer understanding of the dynamics and processes of a particular slow-onset event and the social, cultural and economic contexts of affected communities and places. Such knowledge will help craft interventions that address the multiple dimensions of vulnerability and risks. For instance, though drought and saltwater intrusions have different trajectories of impacts, if left unaddressed, they lead to shocks and stresses for households just the same.

Vulnerable households respond to the effects of slow-onset events differentially, based on their access to assets and capital (physical, human, social, natural, political and financial). While some will be able to smooth out shock and stresses from salinization and drought, for example, others will suffer. The best approaches build on what people have, address underlying causes of vulnerability, and introduce financial measures such as insurance policies that reduces risk. Providing social safety nets through social protection measures such as micro-finance builds household resilience to the impacts of slow-onset events.

Beyond that, governments need to develop and implement comprehensive strategies to deal with the financial impacts of climate change, and offer support for transformative change to build resilience in farmers and the agricultural sector as a whole. These changes may involve regional and international risk-sharing mechanisms, transformative changes in agriculture practices, and assisted migration as a measure of last resort.

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